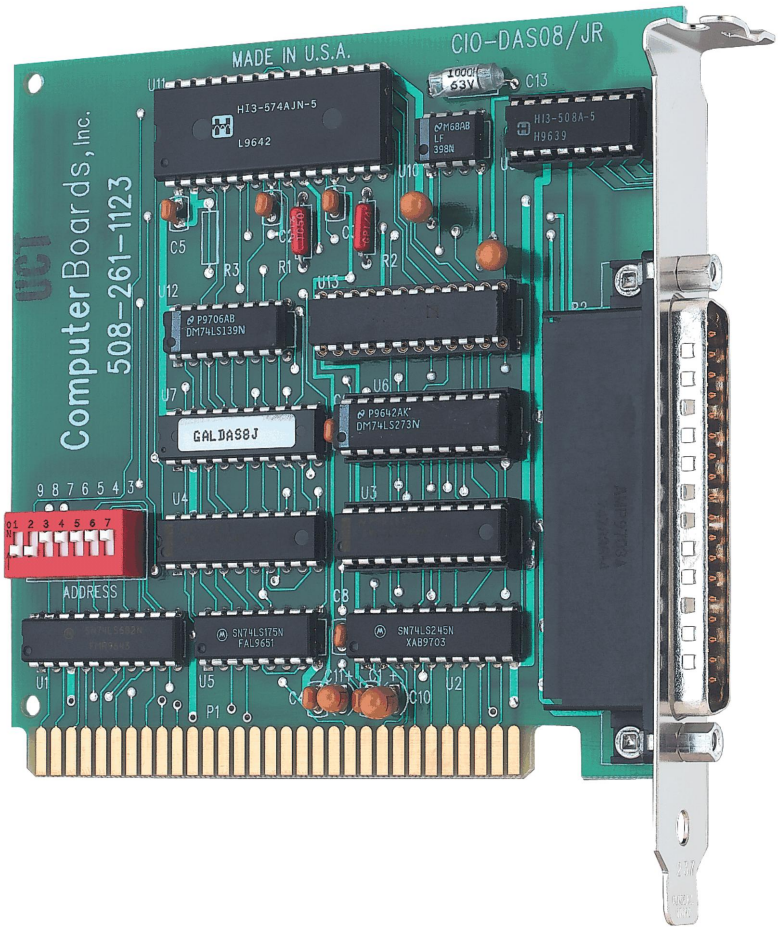
CIO-DAS08/JR-AO

Eight analog inputs, two analog outputs, eight digital inputs, and eight digital outputs

User's Guide



MEASUREMENT COMPUTING™

CIO-DAS08/JR-AO

Analog I/O and Digital I/O

User's Guide

Document Revision 1, January, 2011
© Copyright 2011, Measurement Computing Corporation

Your new Measurement Computing product comes with a fantastic extra —

Management committed to your satisfaction!

Thank you for choosing a Measurement Computing product—and congratulations! You own the finest, and you can now enjoy the protection of the most comprehensive warranties and unmatched phone tech support. It's the embodiment of our mission:

- To provide PC-based data acquisition hardware and software that will save time and save money.

Simple installations minimize the time between setting up your system and actually making measurements. We offer quick and simple access to outstanding live FREE technical support to help integrate MCC products into a DAQ system.

Limited Lifetime Warranty: Most MCC products are covered by a limited lifetime warranty against defects in materials or workmanship for the life of the product, to the original purchaser, unless otherwise noted. Any products found to be defective in material or workmanship will be repaired, replaced with same or similar device, or refunded at MCC's discretion. For specific information, please refer to the terms and conditions of sale.

Harsh Environment Program: Any Measurement Computing product that is damaged due to misuse, or any reason, may be eligible for replacement with the same or similar device for 50% of the current list price. I/O boards face some harsh environments, some harsher than the boards are designed to withstand. Contact MCC to determine your product's eligibility for this program.

30 Day Money-Back Guarantee: Any Measurement Computing Corporation product may be returned within 30 days of purchase for a full refund of the price paid for the product being returned. If you are not satisfied, or chose the wrong product by mistake, you do not have to keep it.

These warranties are in lieu of all other warranties, expressed or implied, including any implied warranty of merchantability or fitness for a particular application. The remedies provided herein are the buyer's sole and exclusive remedies. Neither Measurement Computing Corporation, nor its employees shall be liable for any direct or indirect, special, incidental or consequential damage arising from the use of its products, even if Measurement Computing Corporation has been notified in advance of the possibility of such damages.

Trademark and Copyright Information

TracerDAQ, Universal Library, Measurement Computing Corporation, and the Measurement Computing logo are either trademarks or registered trademarks of Measurement Computing Corporation.

Windows, Microsoft, and Visual Studio are either trademarks or registered trademarks of Microsoft Corporation

LabVIEW is a trademark of National Instruments.

CompactFlash is a registered trademark of SanDisk Corporation.

XBee and XBee-PRO are trademarks of MaxStream, Inc.

All other trademarks are the property of their respective owners.

Information furnished by Measurement Computing Corporation is believed to be accurate and reliable. However, no responsibility is assumed by Measurement Computing Corporation neither for its use; nor for any infringements of patents or other rights of third parties, which may result from its use. No license is granted by implication or otherwise under any patent or copyrights of Measurement Computing Corporation.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form by any means, electronic, mechanical, by photocopying, recording, or otherwise without the prior written permission of Measurement Computing Corporation.

Notice

Measurement Computing Corporation does not authorize any Measurement Computing Corporation product for use in life support systems and/or devices without prior written consent from Measurement Computing Corporation. Life support devices/systems are devices or systems which, a) are intended for surgical implantation into the body, or b) support or sustain life and whose failure to perform can be reasonably expected to result in injury. Measurement Computing Corporation products are not designed with the components required, and are not subject to the testing required to ensure a level of reliability suitable for the treatment and diagnosis of people.

Table of Contents

Preface
About this User's Guide 6
What you will learn from this user's guide 6
Conventions in this user's guide 6
Where to find more information 6

Chapter 1
Introducing the CIO-DAS08/JR-AO 7
Overview: CIO-DAS08/JR-AO features 7
Software features 7

Chapter 2
Installing the CIO-DAS08/JR-AO 8
What comes with your CIO-DAS08/JR-AO shipment? 8
Hardware 8
Additional documentation 8
Optional components 8
Unpacking the CIO-DAS08/JR-AO 9
Installing the software 9
Configuring the CIO-DAS08/JR-AO 9
Installing the CIO-DAS08/JR-AO 10
Connecting the board for I/O operations 10
Connectors, cables – main I/O connector 10
Field wiring, signal termination, and conditioning 11
Calibrating the CIO-DAS08/JR-AO 11

Chapter 3
Specifications 12
Analog input 12
Analog output 12
Digital input/output 13
Power consumption 13
Environmental 13
Main connector and pin out 13
Declaration of Conformity 15

About this User's Guide

What you will learn from this user's guide

This user's guide explains how to install, configure, and use the CIO-DAS08/JR-AO board so that you get the most out of its analog I/O and digital I/O features. This user's guide also refers you to related documents available on our web site, and to technical support resources.

Conventions in this user's guide

The following conventions are used in this manual to convey special information:

For more information on …

Text presented in a box signifies additional information and helpful hints related to the subject matter you are reading.

Caution! Shaded caution statements present information to help you avoid injuring yourself and others, damaging your hardware, or losing your data.

<#:#> Angle brackets that enclose numbers separated by a colon signify a range of numbers, such as those assigned to registers, bit settings, etc.

bold text **Bold** text is used for the names of objects on the screen, such as buttons, text boxes, and check boxes. For example:
1. Insert the disk or CD and click the **OK** button.

italic text *Italic* text is used for the names of manuals and help topic titles, and to emphasize a word or phrase. For example:
The *InstaCal* installation procedure is explained in the *Quick Start Guide*.
Never touch the exposed pins or circuit connections on the board.

Where to find more information

For additional information relevant to the operation of your hardware, refer to the *Documents* subdirectory where you installed the MCC DAQ software (C:\Program Files\Measurement Computing\DAQ by default), or search for your device on our website at www.mccdaq.com.

If you need to program at the register level in your application, refer to the *Register Map for the CIO-DAS08/JR and CIO-DAS08/JR-AO*. This document is available on our website at www.mccdaq.com/registermaps/RegMapCIO-DAS08_JR-AO.pdf.

Introducing the CIO-DAS08/JR-AO

Overview: CIO-DAS08/JR-AO features

The CIO-DAS08/JR-AO provides eight channels of 12-bit analog input, two channels of analog output, and 16 channels of digital I/O.

The CIO-DAS08/JR has eight single-ended analog inputs and two analog outputs. Twelve-bit resolution at a fixed ±5V range is provided for both inputs and outputs. Both DACS are updated simultaneously.

The CIO-DAS08/JR-AO provides eight digital inputs and eight digital outputs for sensing and controlling digital devices. The digital bits are port-addressable, and are dedicated to either input or output. All digital bits are TTL level.

Software features

For information on the features of *Insta*Cal and the other software included with your CIO-DAS08/JR-AO, refer to the *Quick Start Guide* that shipped with your device.

Installing the CIO-DAS08/JR-AO

What comes with your CIO-DAS08/JR-AO shipment?

The following items are shipped with the CIO-DAS08/JR-AO.

Hardware

- CIO-DAS08/JR-AO

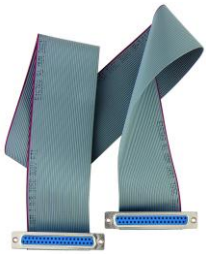
Additional documentation

In addition to this hardware user's guide, you should also receive the *Quick Start Guide* (available in PDF at www.mccdaq.com/PDFmanuals/DAQ-Software-Quick-Start.pdf). This booklet supplies a brief description of the software you received with your CIO-DAS08/JR-AO and information regarding installation of that software. Please read this booklet completely before installing any software or hardware.

Optional components

You can also order the following MCC product to use with your CIO-DAS08/JR-AO.

- C37FF-x cable



- Signal termination and conditioning accessories

  MCC provides signal conditioning and termination products for use with the CIO-DAS08/JR-AO. Refer to Field wiring, signal termination, and conditioning on page 11 for a complete list of compatible accessory products.

Unpacking the CIO-DAS08/JR-AO

As with any electronic device, you should take care while handling to avoid damage from static electricity. Before removing the CIO-DAS08/JR-AO from its packaging, ground yourself using a wrist strap or by simply touching the computer chassis or other grounded object to eliminate any stored static charge.

If any components are missing or damaged, notify Measurement Computing Corporation immediately by phone, fax, or e-mail:

- Phone: 508-946-5100 and follow the instructions for reaching Tech Support.
- Fax: 508-946-9500 to the attention of Tech Support
- Email: techsupport@mccdaq.com

Installing the software

Refer to the *Quick Start Guide* for instructions on installing the software on the *Measurement Computing Data Acquisition Software CD*. This booklet is available in PDF at www.mccdaq.com/PDFmanuals/DAQ-Software-Quick-Start.pdf.

Configuring the CIO-DAS08/JR-AO

Before you install the CIO-DAS08/JR-AO in your computer, you must set the base address by using the dip switch labeled **ADDRESS** located on the board. By default, this address is set to 300 h (768 decimal). The easiest way to set the base address switch is to let *Insta*Cal show you the correct settings. However, if are already familiar with setting ISA base addresses, you may use the base address switch description below to guide your base address selection. The example shown in Figure 1 shows the settings for the factory-default base address of 300 hex.

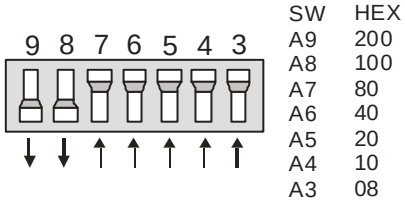


Figure 1. Base address switches

The address logic works by adding up the weights of individual switches to make up a base address. In the default configuration shown in Figure 1, addresses 9 and 8 are DOWN, and all others are UP.
Address 9 = 200 hex (512 decimal) and address 8 = 100 hex (256 decimal); when added together they equal 300 hex (768 decimal).

Disregard the numbers printed on the switch

When setting the base address, refer to the numbers printed in white on the printed circuit board.

PC I/O addresses

Hex Range	Function	Hex Range	Function
000-00F	8237 DMA #1	2C0-2CF	EGA
020-021	8259 PIC#1	2D0-2DF	EGA
040-043	8253 Timer	2E0-2E7	GPIB (AT)
060-063	8255 PPI (XT)	2E8-2EF	Serial Port
060-064	8742 Controller (AT)	2F8-2FF	Serial Port
070-071	CMOS RAM & NMI mask (AT)	300-30F	Prototype card

Hex Range	Function	Hex Range	Function
080-08F	DMA page registers	310-31F	Prototype card
0A0-0A1	8259 PIC #2 (AT)	320-32F	Hard disk (XT)
0A0-0AF	NMI mask (XT)	378-37F	Parallel printer
0C0-0DF	8237 #2 (AT)	380-38F	SDLC
0F0-0FF	80287 numeric CO-P (AT)	3A0-3AF	SDLC
1F0-1FF	Hard disk (AT)	3B0-3BB	MDA
200-20F	Game control	3BC-3BB	Parallel printer
210-21F	Expansion unit (XT)	3C0-3CF	EGA
238-23B	Bus mouse	3D0-3DF	CGA
23C-23F	ALT bus mouse	3E8-3EF	Serial port
270-27F	Parallel printer	3F0-3F7	Floppy disk
2B0-2BF	EGA	3F8-3FF	Serial port

Installing the CIO-DAS08/JR-AO

After you configure the board's switches and jumpers, you can install the CIO-DAS08/JR-AO into your computer. To install your board, follow the steps below.

Install the MCC DAQ software before you install your board

The driver needed to run your board is installed with the MCC DAQ software. Therefore, you need to install the MCC DAQ software before you install your board. Refer to the *Quick Start Guide* for instructions on installing the software.

1. Turn your computer off, open it up, and insert your board into an available ISA slot.
2. Close your computer and turn it on.
3. To test your installation and configure your board, run the *Insta*Cal utility you installed in the previous section. Refer to the *Quick Start Guide* that came with your board www.mccdaq.com/PDFmanuals/DAQ-Software-Quick-Start.pdf for information on how to initially set up and load *Insta*Cal.

Connecting the board for I/O operations

Connectors, cables – main I/O connector

The table below lists the board connector, applicable cables, and compatible accessory products.

Board connector, cables, and accessory equipment

Connector type	37-pin D type connector
Compatible cables	C37FF-x DFCON-37 (mating connector kit)
Compatible accessory products with the C37FF-x cable	CIO-MINI37 CIO-LAB8-TERM

Information on signal connections

General information regarding signal connection and configuration is available in the *Guide to Signal Connections* (available at www.mccdaq.com/signals/signals.pdf).

Pinout – main I/O connector

The CIO-DAS08/JR-AO I/O connector is a standard 37-pin male D connector that is accessible from the rear of the computer through the expansion backplate.

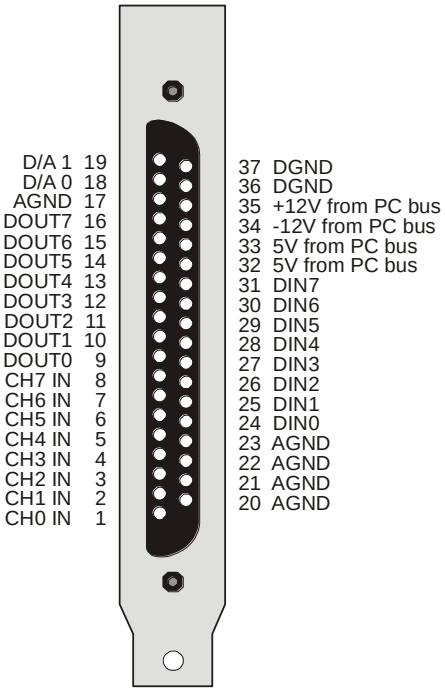


Figure 2. I/O connector pin-out

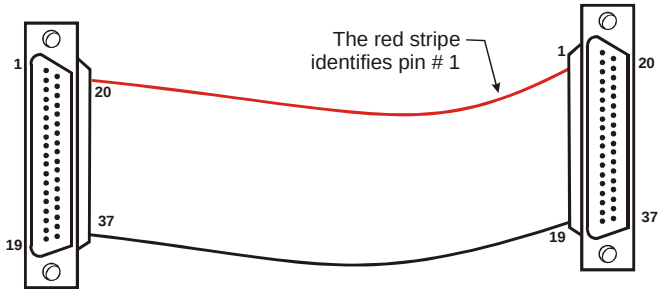


Figure 3. C37FF-x cable

Field wiring, signal termination, and conditioning

You can use the following cabling, screw termination, and signal conditioning products with the CIO-DAS08/JR-AO.

- CIO-MINI37 – 37-pin screw terminal board. Details are available at www.mccdaq.com/products/screw_terminal_bnc.aspx
- DFCON37 – Connector kit that includes a 37-pin female D-connector, D-shell, 37 crimp pins, and cable termination kit to construct your own cable. Details are available at www.mccdaq.com/daq-accessory/DFCON-37.aspx
- CIO-LAB8-TERM – Experimentors Laboratory Screw Terminal Board for the DAS08 series.

Calibrating the CIO-DAS08/JR-AO

You can quickly calibrate the CIO-DAS08/JR-AO using *Insta*Cal. The CIO-DAS08/JR has a fixed input range and does not have any input amplification or gain/offset compensation electronics. When using the optional Universal Library, all compensation for gain/offset errors is done in software after the signal is acquired. The gain and offset calibration factors are stored in the CB.CFG configuration file and applied to the analog samples after they are acquired. Run the **Calibrate** option from *Insta*Cal to set the calibration factors.

Specifications

Typical for 25°C unless otherwise specified.

Specifications in *italic text* are guaranteed by design.

Analog input

Table 1. Analog input specifications

Parameter	Specification
A/D converter type	*AD574*
Resolution	12 bits
Number of channels	8 single-ended
Input ranges	±5 V
A/D pacing	Software polled
Data transfer	Software polled
A/D conversion time	*25 µs*
Throughput	System dependant
Gain drift (A/D specs)	*±50 ppm/°C*
Zero drift (A/D specs)	*±10 ppm/°C*
Absolute maximum input voltage	*±30 V continuous*
Noise Distribution (Rate = N/A, Average % +/- 2 bins, Average % +/- 1 bin, Average # bins)	
Bipolar (5 V)	100% / 100% / 3 bins

Analog output

Table 2. Analog output specifications

Parameter	Specification
D/A converter type	*AD7237*
Resolution	*12 bits*
Number of channels	*2*
Output ranges	±5V
D/A pacing	Software paced
Data transfer	Programmed I/O
Offset error	±2 LSB typical, ±5 LSB max
Gain error	±2 LSB typical, ±5 LSB max
Differential nonlinearity	±0.9 LSB max
Relative accuracy	±1 LSB max
Monotonicity	*Guaranteed monotonic to 12 bits over temperature*
D/A gain drift	±25 ppm/°C max
Settling time (10 V step to ±½ LSB)	10 µs max
Current drive	*±5 mA*
Output coupling	*DC*
Output impedance	*0.5 Ohms max*
Miscellaneous	Update DACs simultaneously

Digital input/output

Table 3. Digital I/O specifications

Digital type	*Output 74LS273* *Input 74LS244*
Configuration	8 fixed input, 8 fixed output
Number of channels	8
Output high	2.7 volts min @ -0.4 mA
Output low	0.5 volts max @ 8 mA
Input high	2.0 volts min, 7 volts absolute max
Input low	0.8 volts max, -0.5 volts absolute min

Power consumption

Table 4. Power consumption specifications

+5V	200 mA typical, 240 A max
+12V	27 mA typical, 35 mA max
-12V	28 mA typical, 36 mA max

Environmental

Table 5. Environmental specifications

Operating temperature range	*0 to 50°C*
Storage temperature range	*-20 to 70°C*
Humidity	*0 to 90% non-condensing*

Main connector and pin out

Table 6. Main connector specifications

Connector type	37-pin D type connector
Compatible cable	C37FF-x DFCON-37 (mating connector kit)
Compatible accessory products with the C37FF-x cable	CIO-MINI37 CIO-LAB8-TERM

Table 7. Connector pin out

Pin	Signal Name	Pin	Signal Name
1	CH0 IN	20	AGND
2	CH1 IN	21	AGND
3	CH2 IN	22	AGND
4	CH3 IN	23	AGND
5	CH4 IN	24	DIN0
6	CH5 IN	25	DIN1
7	CH6 IN	26	DIN2
8	CH7 IN	27	DIN3
9	DOUT0	28	DIN4
10	DOUT1	29	DIN5
11	DOUT2	30	DIN6
12	DOUT3	31	DIN7
13	DOUT4	32	5V from PC bus
14	DOUT5	33	5V from PC bus
15	DOUT6	34	-12V from PC bus
16	DOUT7	35	+12V from PC bus
17	AGND	36	DGND
18	D/A 0	37	DGND
19	D/A 1		

CE Declaration of Conformity

Manufacturer:	Measurement Computing Corporation
Address:	10 Commerce Way Suite 1008 Norton, MA 02766 USA
Category:	Electrical equipment for measurement, control and laboratory use.

Measurement Computing Corporation declares under sole responsibility that the product

CIO-DAS08/JR-AO

to which this declaration relates is in conformity with the relevant provisions of the following standards or other documents:

EU EMC Directive 89/336/EEC: Electromagnetic Compatibility, EN55022 (1987), EN50082-1

Emissions: Group 1, Class B

- EN55022 (1987): Radiated and Conducted emissions.

Immunity: EN50082-1

- IEC 801-2 (1987): Electrostatic Discharge immunity, Criteria A.
- IEC 801-3 (1984): Radiated Electromagnetic Field immunity Criteria A.
- IEC 801-4 (1988): Electric Fast Transient Burst immunity Criteria A.

Declaration of Conformity based on tests conducted by Chomerics Test Services, Woburn, MA 01801, USA in November, 1995. Test records are outlined in Chomerics Test Report #EMI0168A.95.

We hereby declare that the equipment specified conforms to the above Directives and Standards.

Carl Haapaoja, Director of Quality Assurance

Measurement Computing Corporation
10 Commerce Way
Suite 1008
Norton, Massachusetts 02766
(508) 946-5100
Fax: (508) 946-9500
E-mail: info@mccdaq.com
www.mccdaq.com